

Designing User Interfaces and Usability Testing

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Cognizant

USABILITY GROUP

- What I find appropriate from system's perspective
- What's easy to do using: html, Visual Basic, Java Swing, or whatever

About UCD

- Base the design on real people:
 - User needs
 - Work context
 - Tasks they are trying to accomplish
- Multi-stage problem solving process

Why UCD?

- Ensures Learnability
- Hide system complexities from the user
- Consistency in behaviour and form
- Factor-in users like, background into design
- Gather, analyse and structure end user tasks

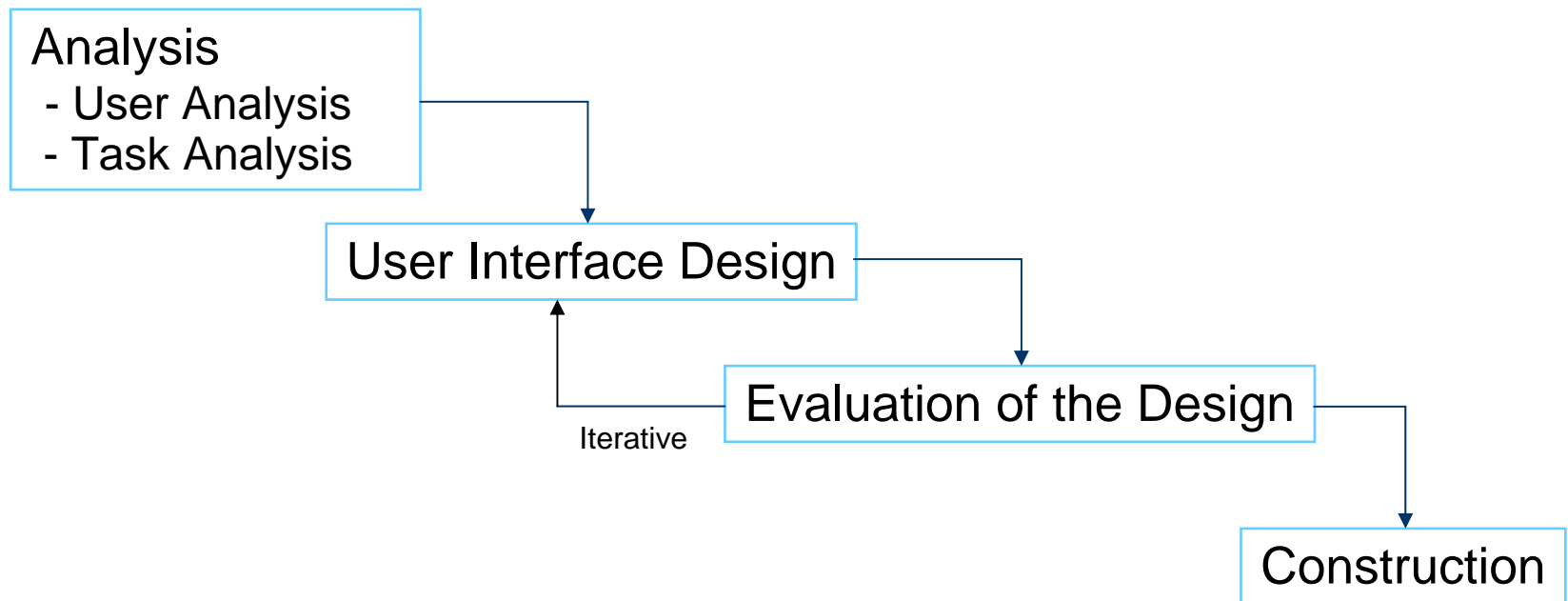
Who Practices UCD?

Human Computer Interaction community is a multidisciplinary team with the following background:

- Human Factors
- Usability Engineering
- Psychology Background
- Graphic designers



Activities

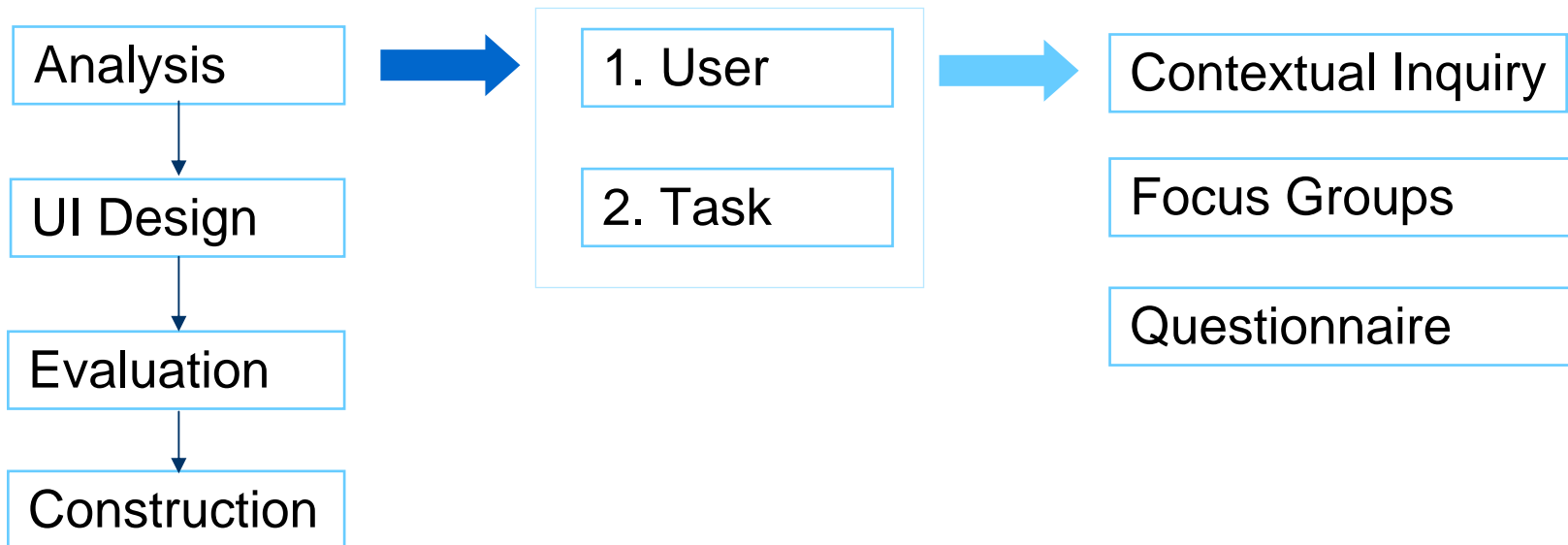


Integration of UCD with SDLC

User Centered Design	Software development Phase
Analysis	Requirements Study
User Interface design	Analysis
Evaluation of the Design	Analysis
Construction	Design

User Analysis

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Purpose

- Identify User Groups
- Understand Users
 - Understand the Ethnographic and Demographic details
- Understand how they do their work
- Understand their work environment

Purpose (contd.)

- Gather End-user Requirements
- Understand user goals
- Understand user problems
- Proper understanding of the business functions

Contextual Inquiry

- Observe people as they work in their work environment
- Inquire about actions

Who are involved in Contextual Inquiry

- Typically end users
- Skilled Usability Engineer



Contextual Inquiry - Pros and Cons

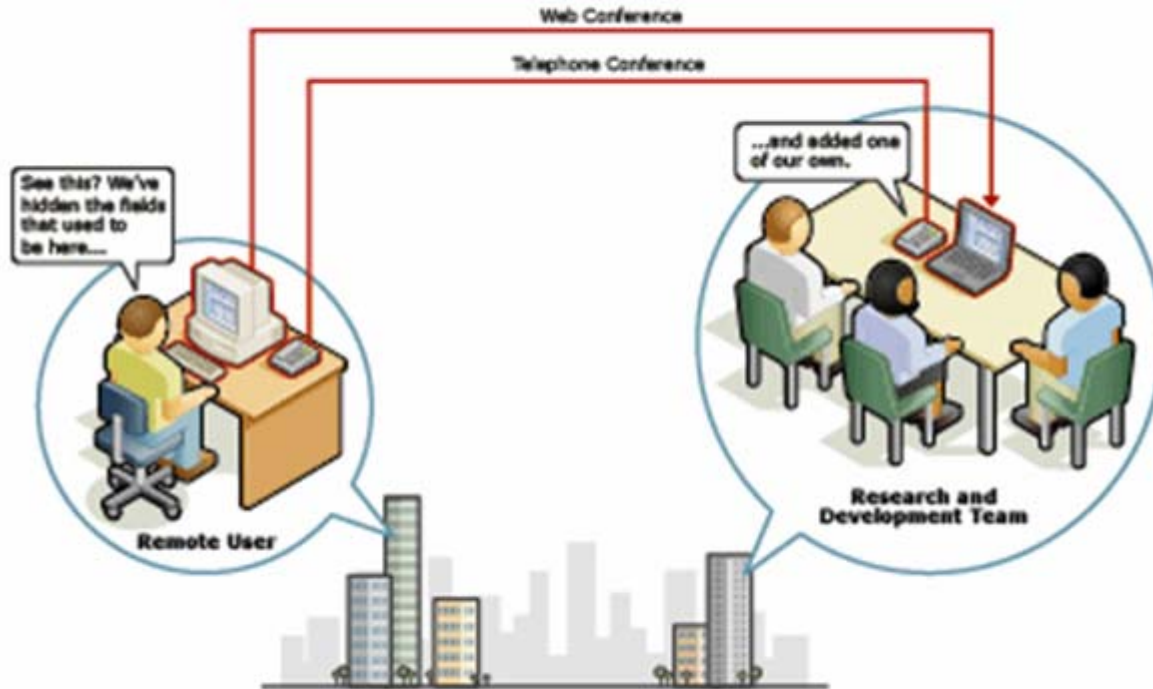
Pros	Cons
Observe how they actually do their work	Require resources and time, User availability
Complete coverage of user requirements along with demographic and ethnographic details	Permission to visit a user site due to security issues

User Analysis - Techniques

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Remote Contextual Inquiry

Remote user describes customized software via telephone and Web conference.



John Stickley - www.visualvocab.com

Focus Groups

- Users participate in a facilitated discussion
- Share their ideas and opinions
- Meet with groups until responses become repetitive

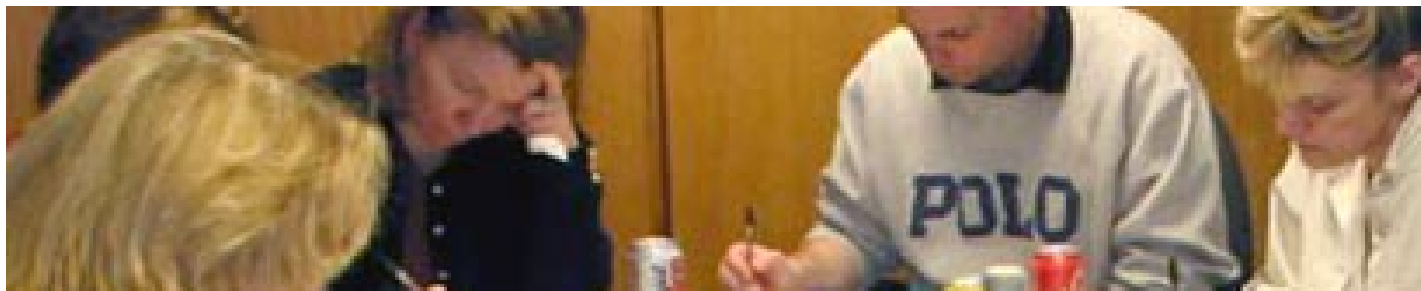
No of users to be involved:

- Typically Users not exceeding 10 users from a user group



Focus Groups - How to Conduct?

- Arrange meeting with a group of Users
- The meeting should have a clear focus, an issue to be discussed
- Also make Users discuss about their experience, issues, concerns
- Record the session if possible for future analysis



Focus Groups - Pros and Cons

Pros	Cons
Raises objections regarding a application or its use that might not be discovered through other means	one dominant participant may affect others
can generate large amounts of data in a relatively short time	subject to known inconsistencies between what people will say in a group and what their actual behavior may be
	The facilitator should be skilled to moderate the sessions, otherwise the focus might be lost.

Questionnaire

Questionnaire is a set of questions sent to the target audience which they fill in and return

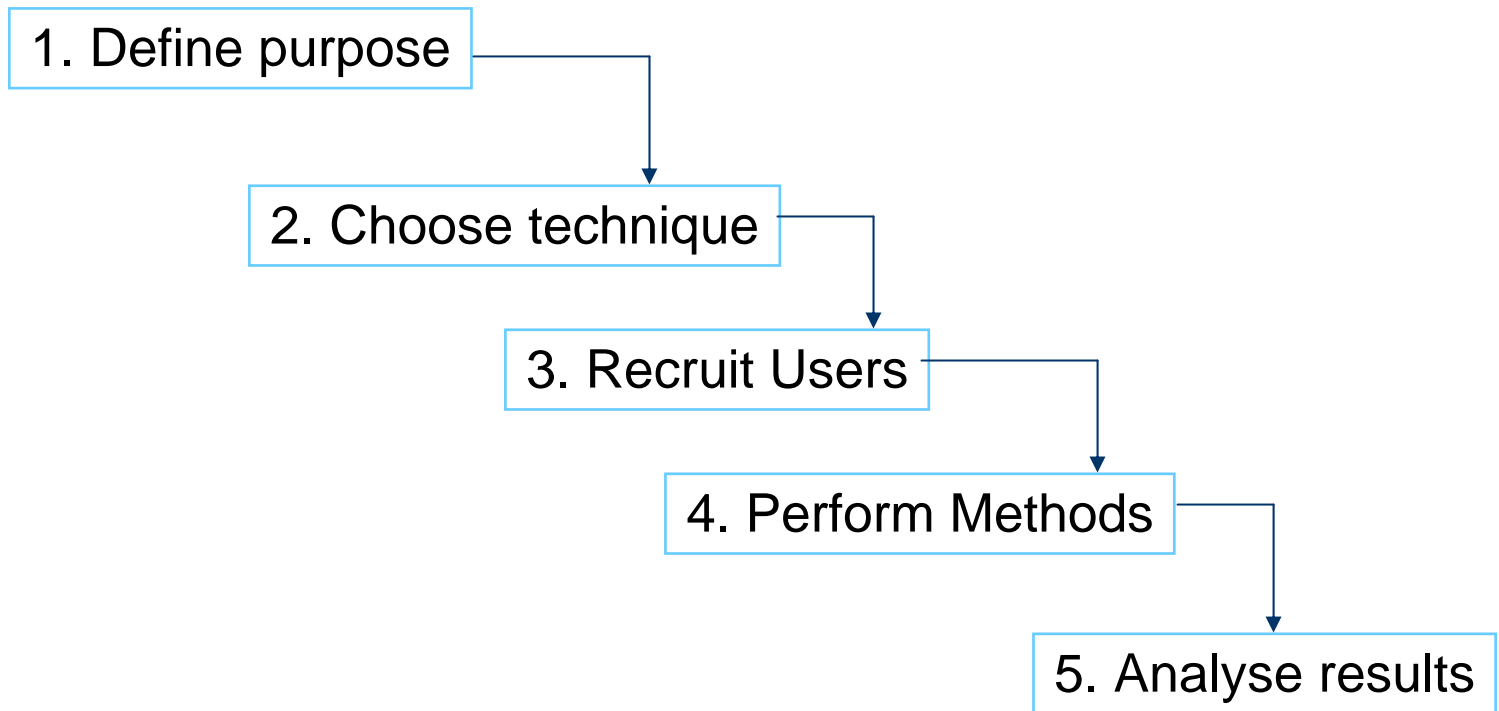
Questionnaire - Pros and Cons

Pros	Cons
Can be sent to a large number of people	if they contain open questions, they are hard to interpret
Can be filled anonymously and hence demographic details can be collected	possibility to follow-up the answers is less
	Everyone might not respond to questionnaires

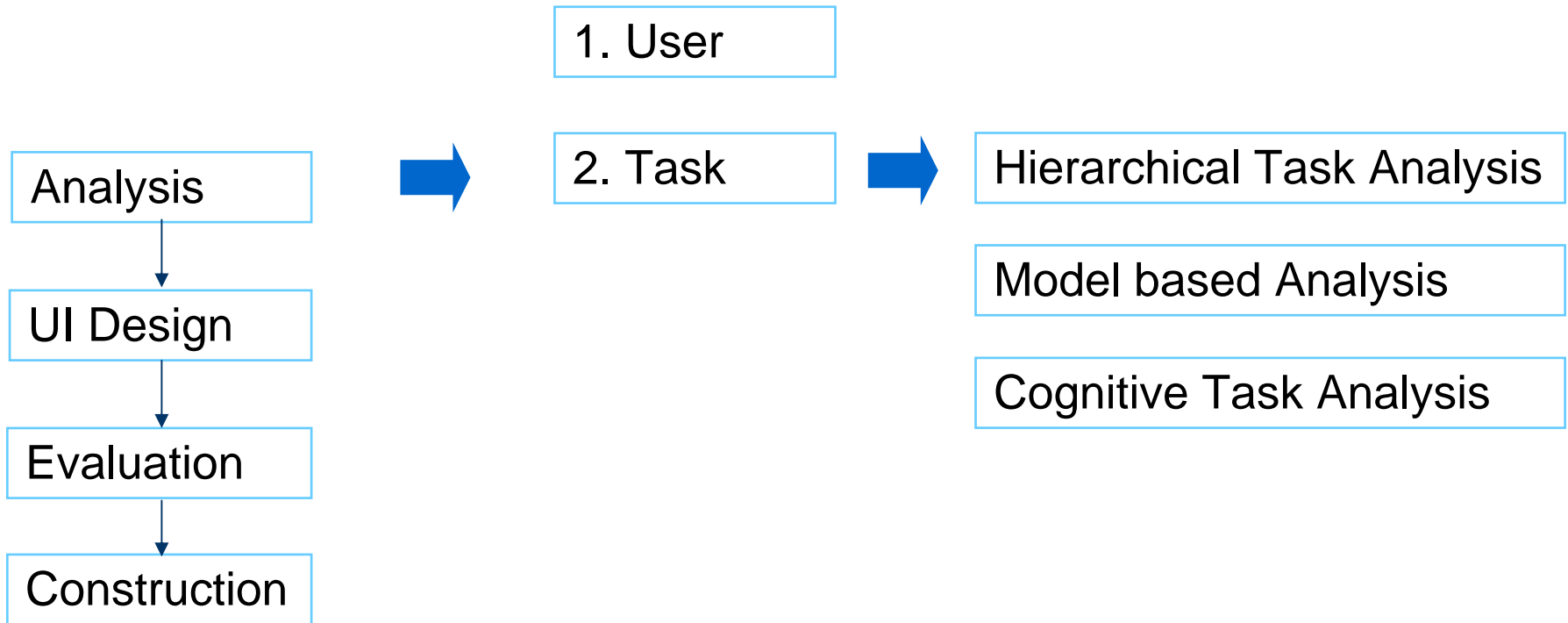
User Analysis

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How to do it?



Task Analysis



Task Analysis

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Task Analysis

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- Determine a set of goals belonging to the target user through observation and interviews
- Determine a set of tasks that support these goals
- Identify the tasks to do a detailed analysis of each of those tasks in terms of frequency, difficulty and importance

Task Analysis

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- Prioritize the tasks based on:
 - Importance of the goals
 - Frequency of task performance
- Highest priority tasks are decomposed into their individual steps

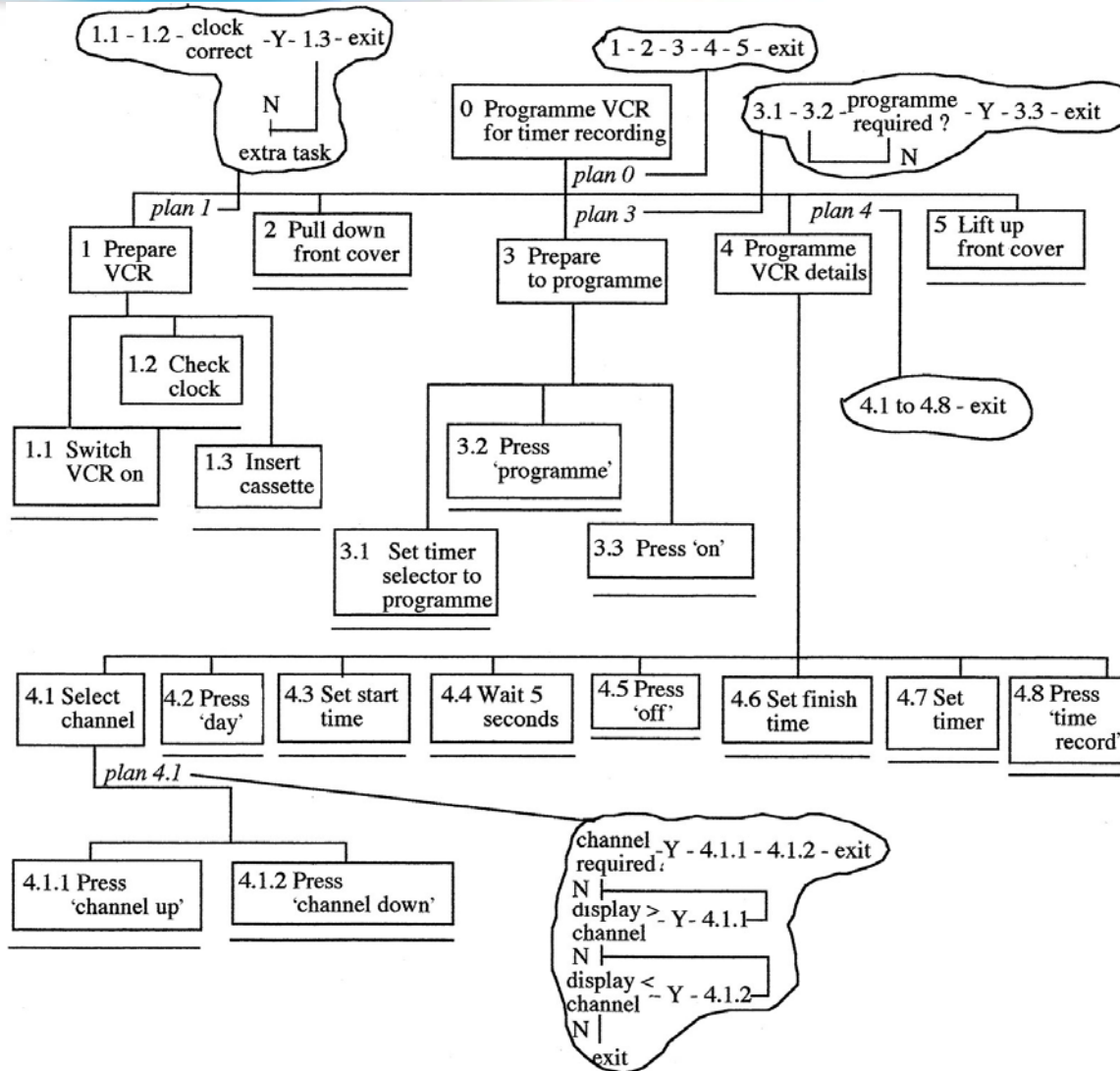
Hierarchical Task Analysis

- Common task analysis method
- Tasks are arranged in the order they are performed
- Larger tasks are broken down into sub-tasks for analysis purposes
- Break down a task from top to bottom, thereby, showing a hierarchical relationship amongst the tasks, and then instruction is sequenced...

Hierarchical Task Analysis

- Example:
 - Application: Product Management Application
 - Interactive Task: Order Product through Phone (the customer has an account/ ID)
 - Sub-Task1: Identification of the customer
 - Action1: Search for a customer by first name and last name
 - Action2: Search for a customer by identification number
 - Sub-Task2: Enter Details for the Order
 - Sub-Task3: Record/ Save the Order

Task Analysis



Hierarchical task analysis for programming a VCR

Model Based Analysis

- Used when the steps for performing certain tasks are extremely vague to define
- Determine what task steps are needed and then sequence those steps in order to accomplish the task
- Some techniques that can be used are: using examples, practice the task, etc.

Cognitive Task Analysis

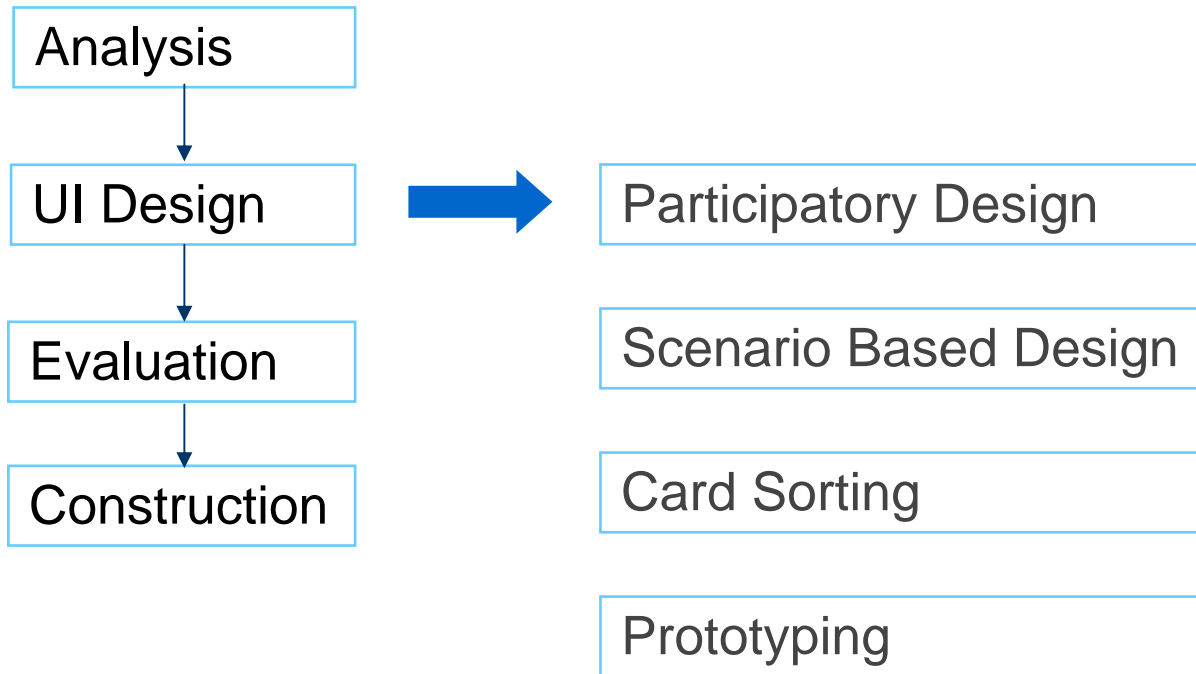
- Family of methods and tools for gaining access to the mental processes that organize and give meaning to observable behavior
- Describe the cognitive processes that underlie performance of tasks and the cognitive skills needed to respond adeptly to complex situations

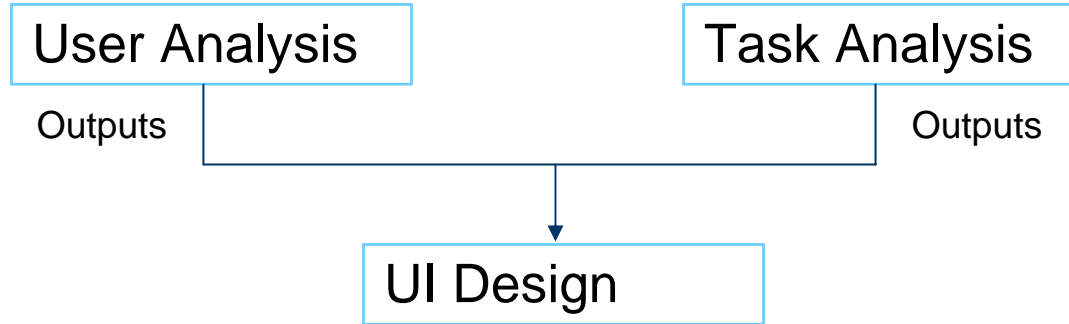
Cognitive Task Analysis - GOMS

Goals, Operators, Methods, and Selection Rules

- Goals represent the goals that a user is trying to accomplish, usually specified in a hierarchical manner
- Operators are the set of atomic-level operations with which a user composes a solution to a goal
- Methods represent sequences of operators, grouped together to accomplish a single goal
- Selection Rules are used to decide which method to use for solving a goal when several are applicable

User Interface Design





UI Design

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Participatory Design

- Developers, Business Representatives and Users work together to design a solution.

Who should attend?

- At least 2 representative users. Real users are the *only* domain experts and the value they add is considerable.
- At least 1 business representative
- At least 1 developer
- At least 1 facilitator

Participatory Design – How it is done?

- Helps to bring in user, technical, business perspectives into UI design
- Lightweight method for envisioning future use possibilities..



Scenario based Design

What is a Scenario?

Scenario is a description of the task in a real world situation that the user can perform with the application from the user's perspective.

How to Write Scenarios?

Scenario writing requires:

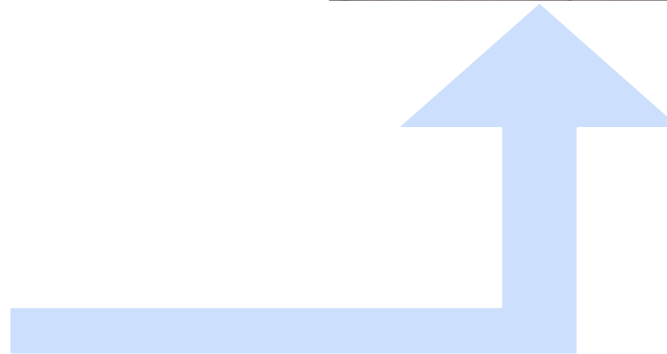
- understanding of the tasks to be supported by the application
- understanding of the users and the context of use.

UI Design – Sample Scenario

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JOE



Sample Scenario

- **Example of Scenario:**

- It's Friday afternoon and Joe is flying to Sydney. He doesn't have enough money for a taxi to the airport, and he's running late.
- He goes to the local ATM and identifies himself and specifies that he wants \$100 from his savings account. He'd like the money in \$20 notes so that he can give the taxi driver the correct change. He doesn't want a printed receipt, as he doesn't bother keeping track of transactions in this account.
- The above Scenario specifically avoids references to transaction cards and PINs.
- This leaves open the possibility of considering a variety of identification and authorization regimes.

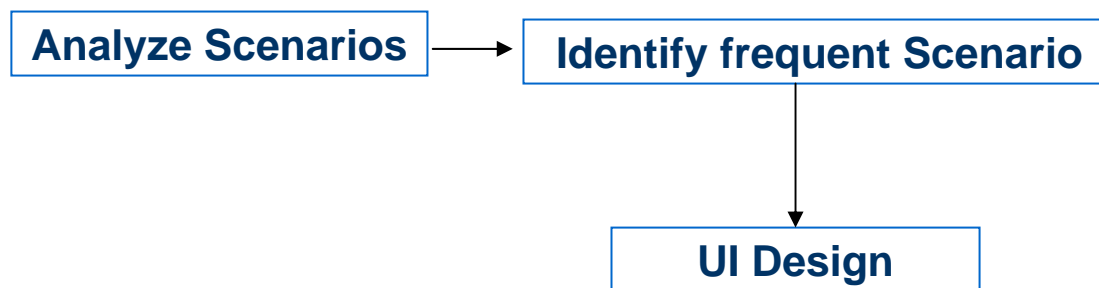
Scenario based Design

How to Write Scenarios?

- Scenarios can be derived from data gathered during contextual inquiry activities.
- Describe in simple language the interaction that needs to take place.
- It is important to avoid references to technology, except where the technology represents a design constraint.
- Scenarios should be reviewed by users to ensure that it is representative of the real world.

Scenario based Design

- Using a scenario, it is possible to capture the context the user is operating in.
- The scenario then drives the design



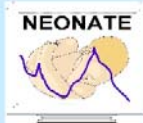
Card Sorting

Items of information are written on individual index cards which are then sorted by users into categories

Types of Card Sorting

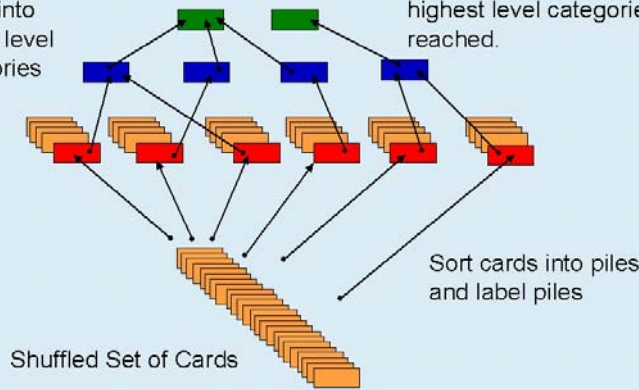
- Open card sorting
- Closed card sorting

Card-Sorting Procedure



Merge label cards into higher level categories

Continue process until highest level categories reached.



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Card sorting captures customer feedback about categorization and labeling

What is Prototyping?

- Development/ construction of a target application
- Quick prototyping would be helpful for Usability testing purposes

The different types of prototyping are:

- Rapid Prototyping, Evolutionary Prototyping, Low-Fidelity Prototyping, High-Fidelity Prototyping,

UI Design

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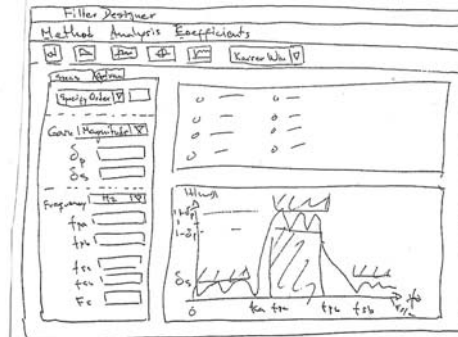
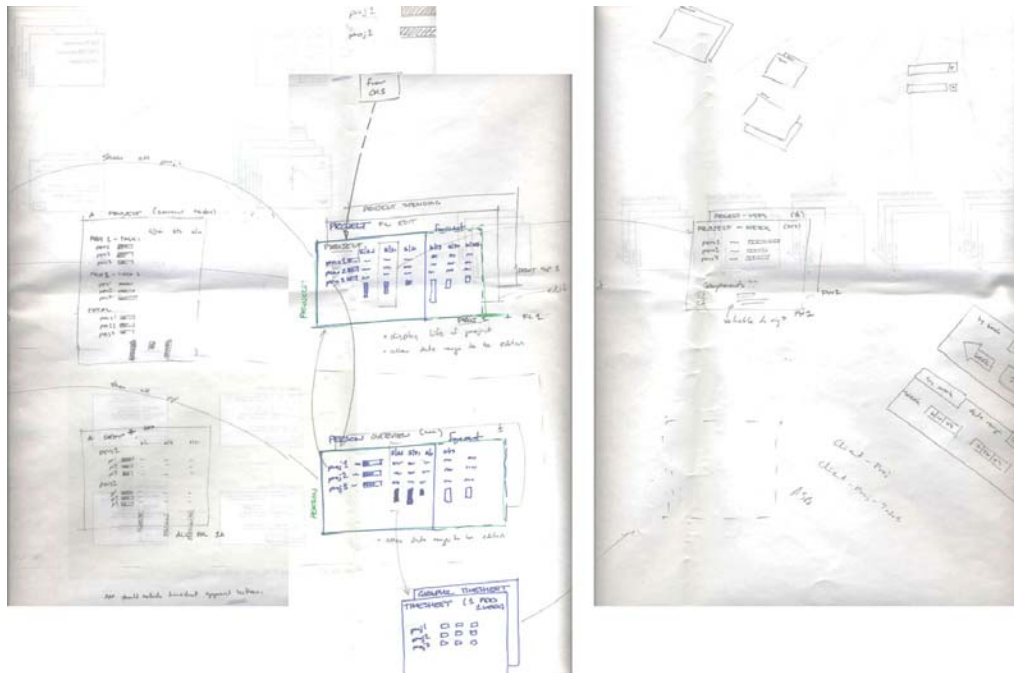


Figure 1.1 A hand-drawn paper prototype of a screen from an application used to design filters for scientific data.

<http://www.cs.usm.maine.edu/~welyt/cos368/topics/prototypingB.htm>



Types of Prototype

- **Low-Fidelity Prototyping**
 - A set of drawings (e.g., storyboard) that provide a static, non-computerized, non-working mock-up of user interface for the planned system
- **High-Fidelity Prototyping**
 - A set of screens that provide a dynamic, computerized, working model of the planned system

How Prototyping is useful?

- Requirement Validation
- Bridges communication gap between developers and end-users
- Demonstrate a working system
- Reduces Development time/ cost
- Results in higher user satisfaction

Usability Testing

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Intro to Usability Testing

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About Usability Testing

- Users are asked to perform a few key tasks (functions) with the product being evaluated
- As the users work, their interactions with the product are directly observed.
- To measure and statistically analyze quantifiable data



Purpose of Usability Testing

- to evaluate User Interface with end users
- To determine user interface design problems on two levels
 - On a conceptual level
 - On a detailed design level
- These information will help to redesign parts (or whole) of the user interface for significantly improved user performance.

Types of Usability Testing

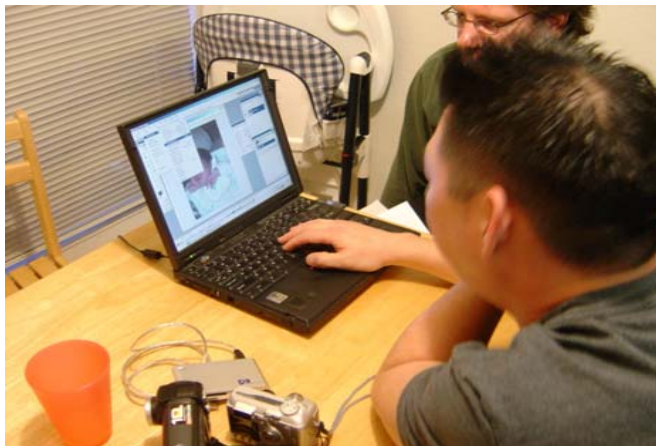
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Laboratory Tests



<http://www.air.org/usability/services/usabilitytesting.html>

Onsite Observations



<http://www.portugal.com/Expertise.htm>

Remote Testing



<http://www.air.org/usability/services/fieldtesting.html>

How to conduct usability test

- Pre-test session
- Session
- Post-test session



Pre-test session

- Set Goals/Objectives for Usability Test

Examples:

- Do users complete a task successfully?
 - If so, how fast do they do each task?
 - Is that fast enough to satisfy them?
- parameters that have to be analyzed
 - Learnability?
 - Productivity?
 - Error rate?
 - Success rate?

Pre-test session

- Identify tasks to be tested
 - Typically 2 – 5 tasks
 - Key task (frequent/critical task of the application)
 - Cover the User Interface Architecture
- Create Scenarios of the task
 - Scenario is a description of the task in a real world environment that the user can perform with the application from the user's perspective

Pre-test session

- Recruit Users
 - Understand the user profile
 - Actual/Representative Users
 - 3 to 5 users per user group
 - When Representative users?
 - How to Handle Cultural Differences?
 - Why only 3 to 5 Users?

Session

- Brief on Usability Test to Users
 - Initiate pre-test questionnaires
 - Briefly explain about usability testing
 - Give time to understand the scenarios
 - Brief user on using techniques like Think aloud
- Conduct Usability Test
 - As users perform the task observe and monitor
 - Video Record the test

What to Measure - Quantitative data

- Time on task
 - Learning Time
 - Number of errors
 - Successful completion of task (yes/no)
-
- How you collect measurements is also determined by facility and equipment

What to watch for – Qualitative Data

- Navigation patterns
 - Getting lost?
- Predictability
 - Understand labels/terminologies?
 - Understand visual design (placement, typography)?
 - Looking for it to work like something else?
- Flexibility
 - Looking for a quicker way?
 - Looking for help?

Laboratory Usability Testing

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Post Session

- Conduct Debriefing Session
 - Interview Users based on Observation during Usability test
 - Institute post test questionnaire
- Analyze test results
 - Time on task
 - Completion of task
 - Error Rate analysis
 - Learnability analysis



Post Session

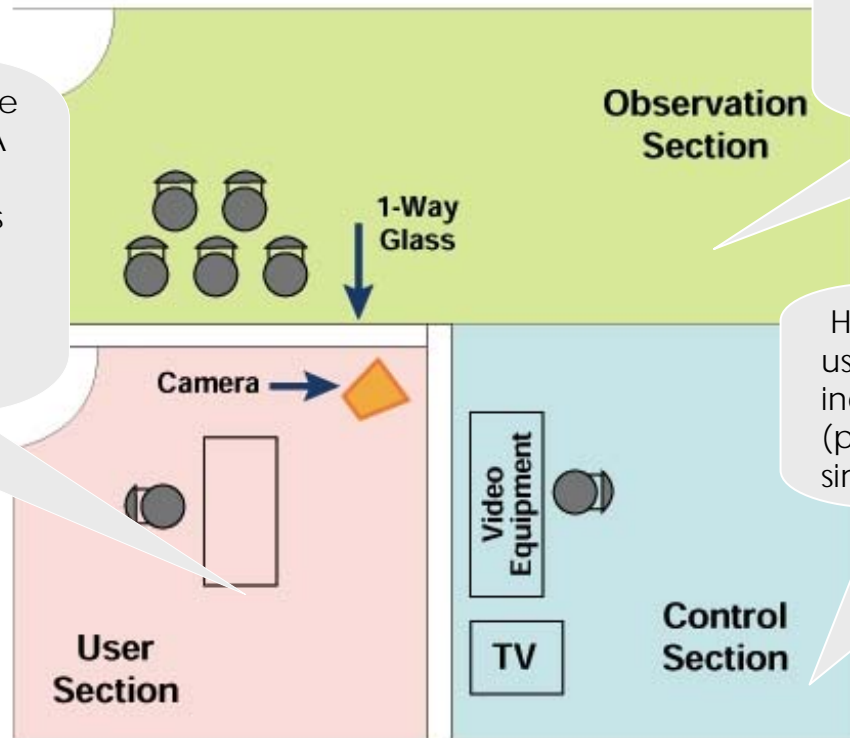
- Prepare Test Report
 - Present the techniques followed
 - Document the data and Observation
 - Conclude with a suggestion of next steps.

Cognizant – Usability Lab

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First Usability Lab in India

Here, an actual or representative user interacts with the product. A camera records the user's body language and hand movements on keyboard, mouse, and manuals. The screen interactions are captured live via a scan converter.



Usability engineers watch the test through a one-way glass or on a large TV monitor on which they can see the screen details.

Here, a remote control unit is used to control the camera. The individual and mixed outputs (picture in picture) are simultaneously video-recorded.

Set up in January 1999

Observation/measurement/analysis of user performance

Laboratory Usability Testing

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User Section



From Cognizant Usability Group

http://www.leede.com/images/ulab_testing_room.jpg

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Observer Section



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Control Section



From Cognizant Usability Group

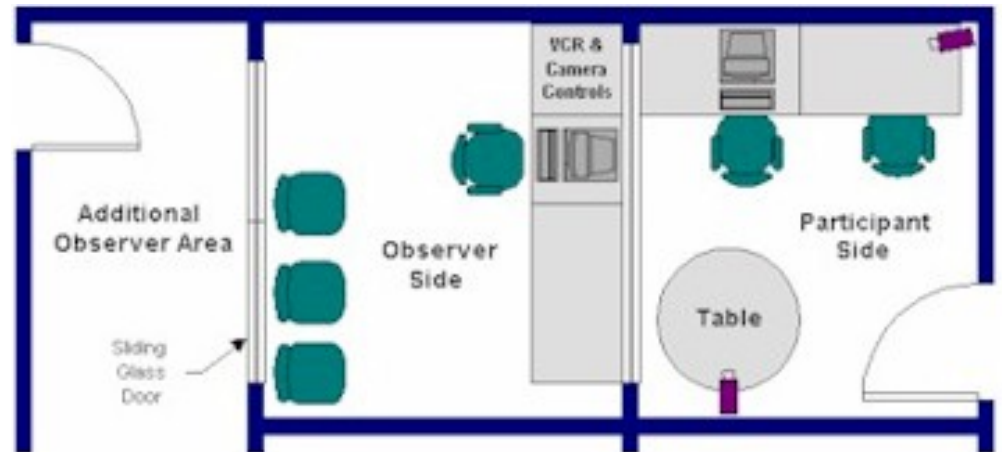


http://www.adage.fi/english/services/usability_testing.html

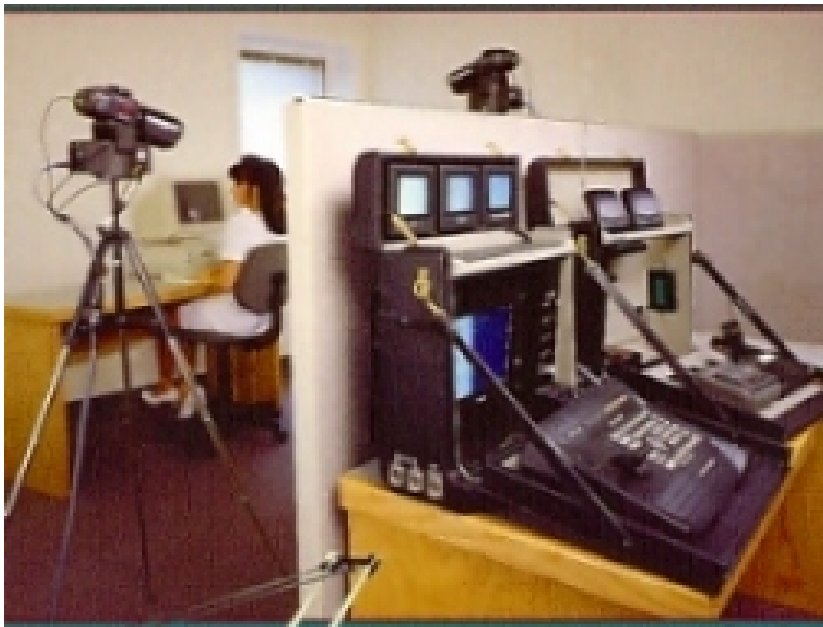
Laboratory Usability Testing

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Floor plan of Microsoft usability Testing Lab



From <http://www.microsoft.com/usability/lab.msp>



From www.usabilitysystems.com

Laboratory Usability Testing

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<http://www.sun.com/usability/>

Laboratory Usability Testing

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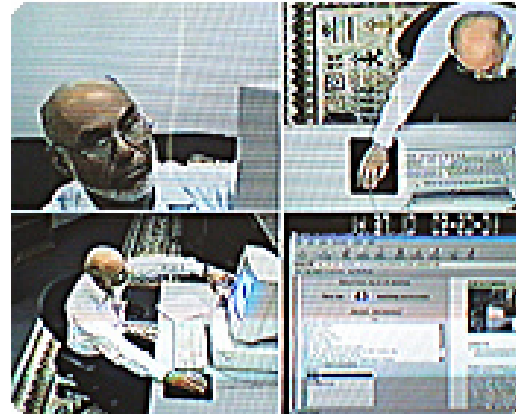
Pros	Cons
Requires well equipped lab with expert to observe and make quantifiable and qualified data.	Users logistics has to be arranged
Statistical analysis could be done and prove the credibility of problems found.	Honorarium and other expenses apart from conducting a test

Onsite Observation

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Pre-requisites to be considered before a test:

- Permission from the clients to test the system with the users
- Permission from the clients to record and to observe the users



Done at the users site

- Users in Natural work environment
- Minimal testing equipments
 - Laptop
 - Video Recording Camera
 - Alternatively hire portable labs



http://www.viewmark.com/index.cgi?CONTENT_ID=295

Onsite Observation

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Portable Labs



Features Available in Portable Labs

- Complete digital recording
- High-resolution capture of test computer interface
- External VGA/Video monitor (TV) ready
- Picture-in-picture capture & viewing
- 17" Video/VGA monitor
- Remote controlled pan-tilt video camera
- Respondent & moderator communication system
- Event logging software
- International electrical compatibility
- Shock-mount flight case
- All cabling & accessories included
- Ongoing technical support

Remote Testing

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- Some equipments Required:

- Web Ex
- Web Camera
- Teleconference facility



<http://www.humanfactors.com/downloads/pastwebcast.asp>

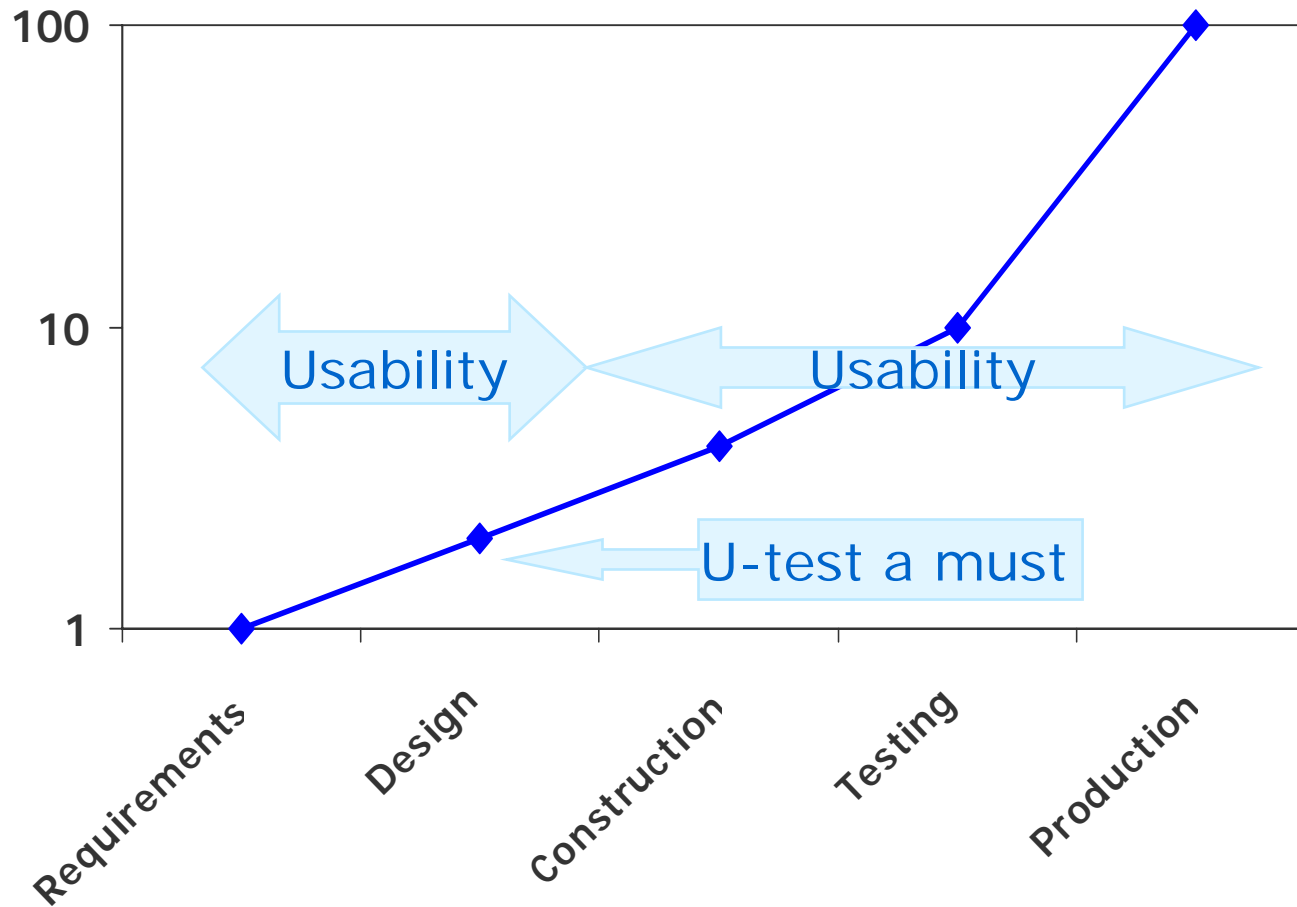
- The users are asked to work with the tasks selected for testing

- Usability Engineers observe the user remotely through Web camera and Web Ex

- The debriefing and conversation happens over the telephone.

The Cost to Make a Change

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Limitations of Testing

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- Guinea pig effect
 - Test environment cannot duplicate the real world
 - Users know they are being watched
- Not thorough by nature
 - Testing a few tasks, not every aspect of application usage
 - Some issues are not readily apparent
 - Use of color and fonts

Usability Testing

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Usability is more than just usability testing...

Construction

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- Detailed design - design the remaining User Interface
- Construct low/ high fidelity prototypes

Advantages

- Increased user acceptance by providing solutions that matches the users needs
- Ease of use
- UCD techniques can resolve design dilemmas
- Reduced maintenance cost by reducing usability related help calls

Conclusion

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- UCD satisfies the user needs/ requirements
- Pi-Engineering – Practice followed in Cognizant Usability Group

Objectives	To come up with high-performance productive applications
Perspectives	Business, Technology in addition to User & Design
Differentiators	Architecture First Model, Business Analysis & Implementation Consulting
Results Delivered	100 -200% productivity gains consistently.
Skills	Business, industry, technology

For more Information visit www.pradeephenry.com